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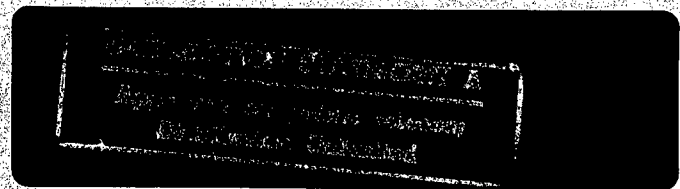
GAO

Report to Congressional Committees

February 1997

NATIONAL MISSILE DEFENSE

Risk and Funding Implications for the Space-Based Infrared Low Component



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National Security and
International Affairs Division

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Congressional Committees

In 1995, the Department of Defense (DOD) made plans for the space and missile tracking system—the low satellite component of the Space-Based Infrared System (SBIRS)—to be deployed in fiscal year 2006. In February 1996, the Congress directed the Secretary of Defense to restructure the SBIRS program and deploy the first space and missile tracking system (hereafter referred to as SBIRS-low) satellite in fiscal year 2002.¹ The Congress also appropriated \$264 million above DOD's fiscal year 1996 and 1997 budget requests to support this deployment acceleration. The purpose was to ensure that the space and missile tracking system provided support to national and theater ballistic missile defenses sooner, rather than later.

DOD has not implemented this congressional directive to accelerate SBIRS-low deployment to fiscal year 2002. It stated that such acceleration was not possible because technical, funding, and management problems had delayed the scheduled launch of two demonstration satellites, the results of which were necessary before deciding to initiate the fabrication of operational SBIRS-low satellites. However, DOD is planning on accelerating deployment to fiscal year 2004 and has directed the Air Force to prepare cost estimates and program plans to support such deployment.

DOD originally estimated SBIRS-low life-cycle costs at \$9.3 billion, which was part of a total estimated life-cycle cost of \$22.6 billion for the SBIRS program during fiscal years 1995 through 2020. In October 1996, however, the Air Force revised SBIRS program costs and informed us that these estimates had decreased to \$7.8 billion and \$17.5 billion for fiscal years 1997 through 2020, respectively. Of the approximate \$5-billion total decrease, the Air Force attributed (1) \$2.5 billion to using a lower inflation index and to excluding fiscal year 1995 and 1996 program costs and (2) \$2.5 billion to plans for using fewer SBIRS-low satellites and different launch vehicles and to acquisition reform and commercial practices. In commenting on our draft report, DOD stated that as of December 1996, SBIRS-low program costs had decreased an additional \$800 million, from \$7.8 billion to \$7 billion for fiscal years 1997 through 2020. However, DOD did not provide a reason for this reduction.

¹See the National Defense Authorization Act for Fiscal Year 1996 (P.L. 104-106, Feb. 10, 1996).

We reviewed the SBIRS-low program to determine the effects of changing the deployment date from fiscal year 2006 (the original schedule) to fiscal year 2002, 2003, 2004, or 2005. To do this, we relied on available Air Force data—some of which was in draft form and none of which, according to DOD, was verified by the Office of the Secretary of Defense. We performed this review under our basic legislative responsibilities and are addressing this report to you because the matters discussed fall within your Committees' jurisdiction.

Results in Brief

Our assessment of four deployment options—fiscal years 2002, 2003, 2004, and 2005—that would accelerate the SBIRS-low program from DOD's originally planned fiscal year 2006 schedule shows some potential differences in risk and variations in funding requirements (see table 1). Our assessment was based on data prepared by the Air Force at various times between June 1995 and November 1996 using various assumptions.

Table 1: Program Risks and Funding Variances in SBIRS-Low Deployment Options Compared to the Original Fiscal Year 2006 Schedule

| Deployment options in fiscal year | Program risk assessment comparison | Estimated funding variances |
|-----------------------------------|---|--|
| 2002 | Higher risk due to concurrent program activities | Additional \$2.1 billion during fiscal years 1997 through 2002 |
| 2003 | Higher risk due to concurrent program activities | Additional \$2.6 billion during fiscal years 1997 through 2002 |
| 2004 | Similar risk due to sequential program activities | Additional \$509 million during fiscal years 1998 through 2003 |
| 2005 | Similar risk due to sequential program activities | Up to \$500 million less during fiscal years 1998 through 2003 |

The fiscal year 2002 and 2003 options would result in higher program risk because of the high degree of concurrent activities between the planned first year of the flight demonstration and the development and fabrication of SBIRS-low satellites. In addition, although program officials stated that total life-cycle costs would not be affected, a substantial amount of additional funding would be required during fiscal years 1997 through 2002 because of compressing the SBIRS-low development, fabrication, and deployment schedule. In commenting on our draft report, DOD stated that the higher costs of the fiscal year 2003 option was due to differences in technical configuration. DOD has not included these additional funding

needs in its future years defense program; thus, the source of such funds would need to be identified.²

If SBIRS-low deployment were scheduled for fiscal year 2004, the first year of the flight demonstration and SBIRS-low engineering and manufacturing development would be sequential, rather than concurrent, allowing time to assess the demonstration results before making a milestone decision on satellite development and fabrication. This schedule would make program risk similar to the fiscal year 2006 schedule, which DOD considers to be low. However, considerable additional funds during fiscal years 1998 through 2003 would be required because of program schedule compression. Upon completing our field work, these additional funding needs had not been included in DOD's future years defense program. However, in commenting on our draft report, DOD stated that recent budgetary actions in December 1996 had identified and programmed the additional funding in the fiscal year 1998 future years defense program.

Under the fiscal year 2005 option, flight demonstration and SBIRS-low development and fabrication would also be sequential, rather than concurrent. This schedule would also make program risk similar to the fiscal year 2006 schedule. Funding requirements during fiscal years 1998 through 2003, however, would be less than those for DOD's original schedule for a fiscal year 2006 deployment. DOD and Air Force representatives initially informed us that fewer funds would be required because of planning for a more efficient production schedule. In commenting on our draft report, however, DOD stated that fewer funds were required because of a different satellite configuration and a lower inflation rate.

The widely divergent results associated with these four deployment options are directly linked to how soon SBIRS-low can and should be scheduled to support national and theater ballistic missile defenses. Although DOD is currently planning on a fiscal year 2004 SBIRS-low deployment, the Congress has not rescinded the requirement in the National Defense Authorization Act for Fiscal Year 1996 to accelerate deployment to fiscal year 2002. How the Congress and DOD resolve these differing views on deployment dates will determine how much program risk may be taken and what the funding requirements would be.

²Planned program execution is dependent on stable funding. Ensuring that sufficient resources are included in DOD's future years defense program is essential for program stability.

We have reported on numerous occasions about the risks associated with program concurrency and of initiating production without adequate testing. The SBIRS-low fiscal year 2002 and 2003 options are analogous situations whereby a planned decision to fabricate satellites would be made before the results of a critical flight demonstration are available.

At this point in time, however, the Congress does not have complete and consistent information on the program risks and the need for additional funding associated with the various options to accelerate SBIRS-low deployment. The Air Force's data on these options were prepared at different times using different assumptions, and the Air Force recently established a new SBIRS program baseline using revised life-cycle costs.

Appendix I contains the details of our assessment.

Agency Comments and Our Evaluation

In commenting on a draft of this report, DOD stated that the report describes many of the issues and problems that have affected the program in the past year and that as recently as December 1996, the Air Force and DOD made some key decisions to focus development and stabilize funding. DOD indicated that, to provide budgetary and technical discipline, the program has been upgraded to a major defense acquisition program and a Defense Acquisition Board review has been scheduled for the spring of 1997. DOD also noted that it had added funding to enhance the program definition/risk reduction phase of the program and had established a fiscal year 2004 deployment date to best balance technical risk and available funding.

According to DOD, the Congress has accepted these actions as being in conformance with its objectives and will be provided additional information following the Defense Acquisition Board review. Given these developments, DOD believes that the dialogue on various deployment options has been successfully concluded and disagrees with our recommendation that it provide additional information on the fiscal year 2002, 2003, 2004, and 2005 deployment options.

Despite DOD's apparent plans to deploy SBIRS-low in fiscal year 2004, the Congress has not changed the requirement in the National Defense Authorization Act for Fiscal Year 1996 for deployment in fiscal year 2002. In addition, DOD officials could not provide documentation supporting their claim of "broad congressional support" for the fiscal year 2004 deployment. DOD stated that (1) it had struggled with identifying

deployment costs and technical risk for a variety of different satellite options and deployment dates, (2) the different technical assumptions and costing methodologies used for the various deployment options had caused confusion and uncertainty in the Congress, and (3) our report accurately identified these problems. Also, DOD representatives have informed us that the current SBIRS-low cost estimate, a portion of which is included in the fiscal year 1998 future years defense program, could change pending the results of an independent cost analysis.

In view of these facts, we reaffirm our recommendation that DOD fully inform the Congress about the feasibility and effects of accelerating SBIRS-low deployment for the fiscal year 2002, 2003, 2004, and 2005 deployment options.

DOD's comments also provided suggestions to improve the technical accuracy and clarity of the report and we have incorporated them in the text where appropriate. DOD's comments are reprinted in their entirety in appendix II.

Recommendation

To fully inform the Congress about the feasibility and effects of accelerating SBIRS-low, we recommend that the Secretary of Defense provide the congressional defense committees with complete, consistent, and current information that discusses program risk, revised program costs, and any additional funding needs and sources for the fiscal year 2002, 2003, 2004, and 2005 deployment options.

Matters for Congressional Consideration

The Congress may wish to consider the costs and risks of DOD's plans to deploy the first SBIRS-low satellite in fiscal year 2004, relative to the statutory requirement in the National Defense Authorization Act for Fiscal Year 1996 to deploy the first satellite in fiscal year 2002 and revise the requirement as necessary.

If DOD does not provide the Congress with complete, consistent, and current information on program risks, revised program costs, and any additional funding needs and sources for the fiscal year 2002, 2003, 2004, and 2005 deployment options for use in making its decision, the Congress may wish to require that DOD provide it.

Scope and Methodology

The scope of our review involved the SBIRS-low component of the SBIRS program and included an examination of program risks and changes in funding requirements for various SBIRS-low deployment options. The information for the options was developed by the Air Force at different times between June 1995 and October 1996 for different purposes to assess the feasibility of deploying SBIRS-low in fiscal years 2002, 2003, 2004, and 2005. Because the Air Force did not use the same assumptions to assess these options, a consistent comparison of changes in funding requirements was not possible. For example, the options included different satellite configurations and launch vehicles. According to DOD, these different assessments led to disparities in cost and technical estimates. Although we requested estimated funding requirements for each option year that used the same assumptions, the SBIRS program director stated that such a comparison was no longer meaningful because the Air Force was preparing for a fiscal year 2004 deployment option decision. Despite this lack of consistency, we believe that comparing this information with the fiscal year 2006 deployment schedule provides some indication of the funding and program risk differences.

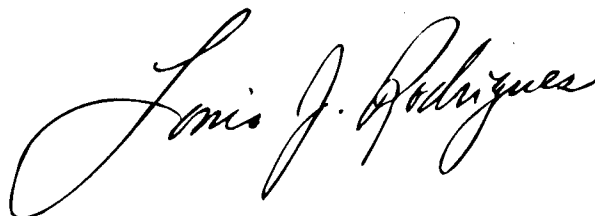
We performed our work primarily at the Air Force Space and Missile Systems Center and Aerospace Corporation in Los Angeles, California, and the U.S. and Air Force Space Commands in Colorado Springs, Colorado. We reviewed program requirements and briefings, acquisition and test plans, budgetary information, management reports, and internal memoranda.

In addition, we held discussions with representatives and obtained documentation from the Office of the Deputy Under Secretary of Defense for Space, the Air Force's Office of the Assistant Secretary for Acquisition, and the Ballistic Missile Defense Organization in Washington, D.C., and the Air Force's Phillips Laboratory in Albuquerque, New Mexico. We also held discussions with and obtained documents from representatives of the TRW Space and Electronics Group and Hughes Aircraft Company, which is the contracting team that is developing and fabricating two flight demonstration satellites.

We performed our work from October 1995 through September 1996 in accordance with generally accepted government auditing standards.

We are sending copies of this report to the Secretaries of Defense, the Air Force, the Army, and the Navy; the Director of the Ballistic Missile Defense Organization; and the Director of the Office of Management and Budget. We will make copies available to others upon request.

This report was prepared under the direction of Thomas J. Brew, Associate Director, Defense Acquisitions Issues, who may be reached on (202) 512-4841 if you or your staff have any questions concerning information in this report. Major contributors to this report are listed in appendix III.

A handwritten signature in cursive script that reads "Louis J. Rodrigues". The signature is written in black ink and is positioned above the printed name and title.

Louis J. Rodrigues
Director, Defense Acquisitions Issues

List of Congressional Committees

The Honorable Strom Thurmond
Chairman
The Honorable Carl Levin
Ranking Minority Member
Committee on Armed Services
United States Senate

The Honorable Ted Stevens
Chairman
The Honorable Daniel Inouye
Ranking Minority Member
Subcommittee on Defense
Committee on Appropriations
United States Senate

The Honorable Floyd D. Spence
Chairman
The Honorable Ronald V. Dellums
Ranking Minority Member
Committee on National Security
House of Representatives

The Honorable C.W. Bill Young
Chairman
The Honorable John P. Murtha
Ranking Minority Member
Subcommittee on National Security
Committee on Appropriations
House of Representatives

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Abbreviations

| | |
|-------|---|
| DOD | Department of Defense |
| DSP | Defense Support Program |
| EMD | engineering and manufacturing development |
| SBIRS | Space-Based Infrared System |

Program Plans, Congressional Direction, and Deployment Options

The Department of Defense's (DOD) Defense Support Program (DSP)—a strategic surveillance and early warning satellite system with an infrared capability to detect long-range ballistic missile launches—has been operational for about 25 years. Since the early 1980s, DOD's efforts to replace DSP with more modern capability have been unsuccessful because of immature technology, high cost, and affordability issues. These aborted efforts have included the Advanced Warning System; the Boost Surveillance and Tracking System; the Follow-on Early Warning System; and the Alert, Locate, and Report Missiles system.

DSP's capabilities in theater situations became increasingly important during the 1991 Persian Gulf War with the launching of SCUD missiles by Iraq. However, more timely and accurate information was needed on these short-range ballistic missile launches. The Air Force subsequently made changes in DSP data processing to achieve an enhanced capability—a system known as Attack and Launch Early Reporting to Theater—without modifying the DSP satellite sensors. However, DOD concluded that expanding theater warning requirements necessitated new sensor technology, and it began planning for an improved infrared satellite sensor capability that would support both strategic and theater operations.

Current DSP Replacement Plans

In 1994, DOD initiated a study¹ to consolidate various infrared space requirements. Based on the study results, it selected the Space-Based Infrared System (SBIRS) to replace DSP. SBIRS is expected to use more sophisticated infrared technologies, which are intended to enhance the detection and tracking of strategic and theater ballistic missile launches and provide critical data for national and theater missile defense systems, than DSP.

The SBIRS architecture consists of space and ground processing segments. The space segment contains both high and low orbit components. The high component is to consist of four satellites operating in geosynchronous earth orbit and sensors on two host satellites operating in a highly elliptical orbit.² In commenting on our draft report, DOD officials stated that for planning purposes the SBIRS-low component consists of 24 operational satellites in low earth orbit. However, the SBIRS-low

¹Referred to as the Office of the Secretary of Defense Space-Based Warning Summer Study.

²A satellite in a geosynchronous orbit has a circular period of revolution that is equal to the period of the earth's rotation about its axis, or 24 hours. A satellite in a highly elliptical orbit spends most of its time over a designated area of the earth, known as apogee dwell.

constellation could consist of more or less satellites depending on the results of contractor cost and performance studies.

The ground processing segment is to consist of a mission control station in the United States, a communication system, and two overseas ground stations. The Air Force plans to develop the ground segment in three increments. Increment I is to consolidate the existing DSP ground processing operations. During increment II, the Air Force plans to integrate the high component satellites' data processing with the consolidated DSP operations. Increment III is to incorporate the functions and equipment necessary to support SBIRS-low when it is deployed.

DOD decided to deploy the high orbit component beginning in fiscal year 2002 because of (1) an urgent need to replace DSP, primarily for theater missile defense purposes; (2) the low program risk associated with technology, infrastructure, and schedule; and (3) the system's ability to meet key performance parameters. DOD determined that SBIRS-low could be deployed in fiscal year 2006 and planned to make a deployment decision in fiscal year 2000 after key technologies and operating concepts were validated on two demonstration satellites scheduled for launch in fiscal year 1999. DOD's rationale for deploying SBIRS-low at a later date was because (1) the national missile defense mission for SBIRS, which only this component could satisfy, was not a key requirement and (2) the risk associated with antiballistic missile treaty issues, technology, cost, schedule, and operational complexity was high.

Congressional Emphasis on Early SBIRS-Low Deployment

The National Defense Authorization Act for Fiscal Year 1996 required the Secretary of Defense to accelerate the space and missile tracking system (now called SBIRS-low) deployment of the first satellite to fiscal year 2002. The purpose was to ensure that SBIRS-low provided support to national and theater ballistic missile defenses sooner, rather than later. To help achieve this objective, the Congress appropriated an additional \$135 million above DOD's fiscal year 1996 budget request.

During deliberations on DOD's fiscal year 1997 budget request, the Congress reiterated its desire that SBIRS-low deployment be accelerated, and it appropriated \$129 million above DOD's budget request to do so. The Congress also expressed disappointment with DOD for not (1) responding

in a timely manner to the fiscal year 1996 statutory requirement and (2) obligating all of the fiscal year 1996 SBIRS-low funds as directed.³

In responding to the congressional direction, the Under Secretary of Defense for Acquisition and Technology wrote, in a July 24, 1996, letter to congressional committees, that accelerated deployment of SBIRS-low beginning in fiscal year 2002 was not possible because technical, funding, and management problems had delayed the scheduled launch of the two demonstration satellites from the first quarter to the third quarter of fiscal year 1999. According to Air Force officials, this delay prevented basing a milestone decision to enter the engineering and manufacturing development (EMD) phase of the SBIRS-low acquisition process, scheduled for the first quarter of fiscal year 2000, on the results of the planned flight demonstration.

Earlier, in a July 10, 1996, letter, the Under Secretary requested that the Defense Science Board assess the viability of accelerating SBIRS-low deployment. In September 1996, based on the Board's findings and recommendations, the Under Secretary directed the Air Force to (1) prepare for a SBIRS-low deployment decision no later than April 15, 1997, and (2) develop an acquisition strategy, an acquisition program baseline, an independent cost assessment, and a preliminary test plan that would support SBIRS-low deployment in fiscal year 2004. The purpose of the planned April decision was to choose between the fiscal year 2004 option and the fiscal year 2006 original schedule. Also, in September 1996, the Under Secretary appeared before a congressional panel, testifying on ballistic missile defense, and stated that DOD was considering the affordability of accelerating SBIRS-low deployment to fiscal year 2004.⁴ In commenting on our draft report, DOD stated that a fiscal year 2004 deployment decision was made in December 1996. However, the Acquisition Decision Memorandum documenting this decision will not be finalized until the spring of 1997.

Flight Demonstration Satellites Are Critical to SBIRS-Low

The flight demonstration program includes three satellites—one low altitude demonstration system satellite for competitive development purposes and two satellites for flight demonstration purposes. The low altitude demonstration system satellite is to (1) provide an alternative to

³DOD subsequently released all of these funds to the Air Force, which has until September 30, 1997, to obligate them.

⁴Testimony before a joint session of the Subcommittee on Military Research and Development and the Subcommittee on Military Procurement of the House Committee on National Security, Sept. 27, 1996.

the contractor team that is now fabricating the two flight demonstration satellites and (2) reduce program and technical risks.

The two flight demonstration satellites are to validate the integration of key technologies and operational concepts that are critical to national missile defense and other SBIRS missions. The Air Force draft test plan calls for launching a single ballistic missile target to demonstrate the ability of these satellites to perform this national missile defense function. Also, the Air Force intends to participate in Ballistic Missile Defense Organization tests designed to further demonstrate the ability of the two satellites to detect and track ballistic missiles. It plans to use the results of the demonstration and tests to model and simulate the full performance capability of a constellation of operational SBIRS-low satellites.

In commenting on our draft report, DOD stated that it has approved additional theater and national missile defense targets for the flight demonstration program. In doing so, it programmed \$149 million for one theater and one national missile defense target for the low altitude demonstration system and one theater missile defense target for the flight demonstration satellites. According to DOD officials, these additional missile tests were added to give needed statistical validity to the test results.

The results of the planned flight demonstration, prior to the Board's recommendations, were intended to form the basis for decision-making regarding SBIRS-low development, fabrication, and deployment—that is entry into the EMD phase of the acquisition process. The primary emphasis is on the ability to detect and track ballistic missiles and their warheads throughout flight and distinguish between missile warheads and decoys. According to program officials, performing this function autonomously while in orbit is one of the most complex and technologically challenging operational concepts ever attempted. They believe that a national missile defense system with space-based sensors depends on a successful flight demonstration program. They stated that proceeding into the EMD phase prior to demonstrating this capability would not provide an opportunity to assess lessons learned, thus introducing unacceptable risk into the program.

In commenting on our draft report, DOD emphasized that the flight demonstration program was extended from 1 year to 2 years. It stated that the extension was needed to participate in scheduled Ballistic Missile Defense Organization tests, as well as to fully use the satellites during their

2- to 3-year life expectancy. However, DOD officials stated that information collected during the first year of the test program is the most critical for making a decision of whether to enter EMD.

We have reported on numerous occasions about the risks associated with program concurrency and of initiating production without adequate testing. SBIRS-low could be an analogous situation. For example, in 1990, we concluded that although concurrency can be used to expedite the development and production of weapon systems, rushing into production (in this case, satellite fabrication) before critical tests (in this case, flight demonstration) are successfully completed has resulted in the purchases of systems that do not perform as intended. And, in 1994, we reported that programs are often permitted to begin production with little or no scrutiny, and the consequences have included procurement of substantial inventories of unsatisfactory weapons requiring costly modifications to achieve satisfactory performance, and in some cases, deployment of substandard systems to combat forces.⁵

Assessment of SBIRS-Low Deployment Options

In response to congressional direction to accelerate SBIRS-low deployment to fiscal year 2002, the Air Force assessed a range of potential deployment options that included fiscal years 2002, 2003, 2004, and 2005. The information for these option years was prepared at different times between June 1995 and October 1996 and did not always contain the same assumptions. Although a consistent comparison with the fiscal year 2006 original deployment schedule of changes in funding requirements for each option was not made, the assessments provide some indication of the differences in funding requirements.

Fiscal Year 2002 and 2003 Options Create Higher Program Risk and Substantial Additional Funding Requirements

If SBIRS-low deployment were accelerated from the originally planned date of fiscal year 2006 to fiscal year 2002 or 2003, DOD would face higher program risks and substantial additional funding requirements in its future years defense program. Both of these deployment options are similar because the increased risk would result primarily from the scheduled concurrent activities between the first year of the flight demonstration program and the EMD phase.

Based on the currently planned launch of the two demonstration satellites in the third quarter of fiscal year 1999, from 4 to 8 months of the scheduled

⁵Weapon Systems: Concurrency in the Acquisition Process (GAO/T-NSIAD-90-43, May 17, 1990) and Weapons Acquisition: Low-Rate Initial Production Used to Buy Weapon Systems Prematurely (GAO/NSIAD-95-18, Nov. 21, 1994).

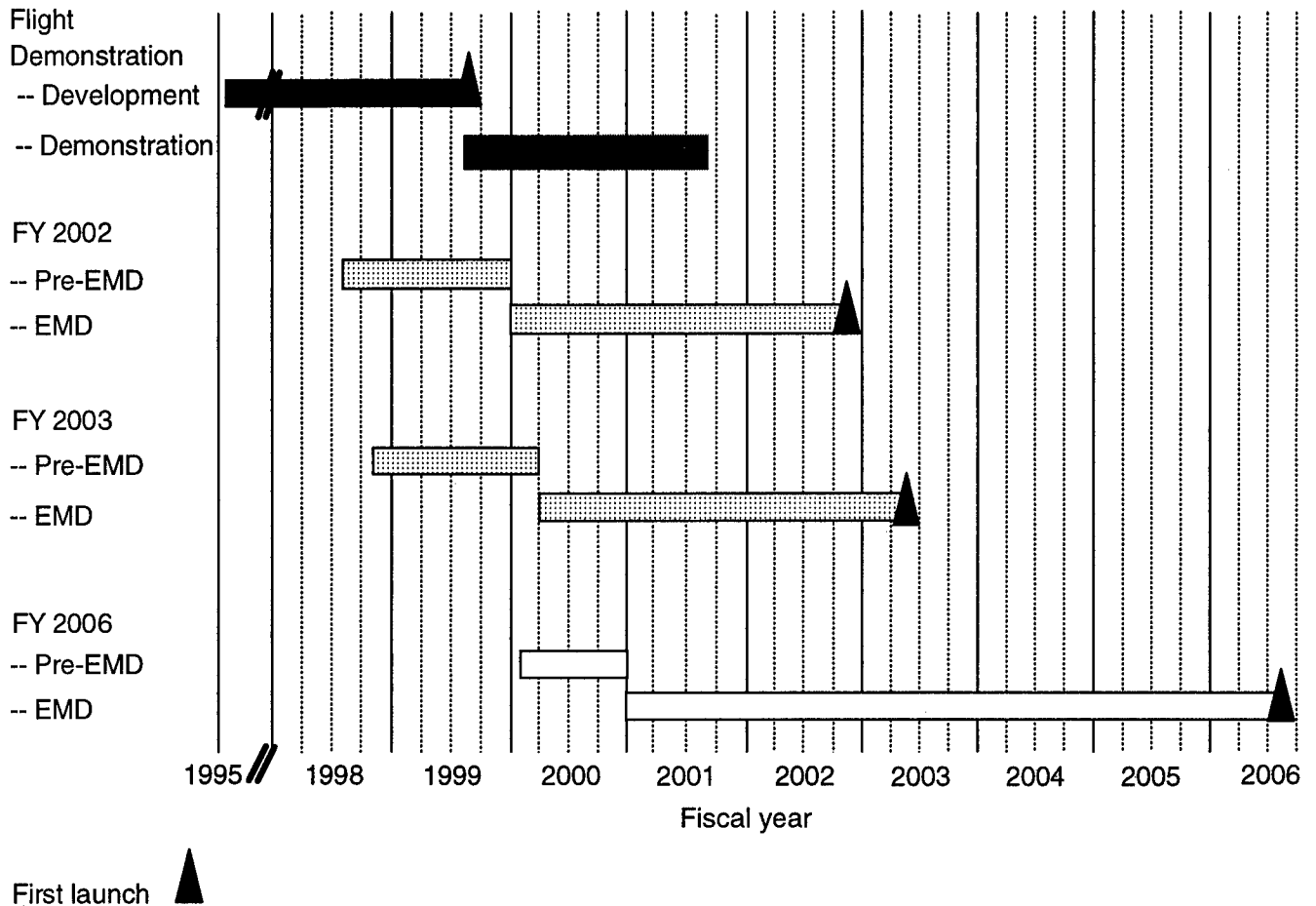
first year of the flight demonstration program would overlap with the EMD phase. Thus, a decision on whether the system should enter the EMD phase could not be based on an analysis of demonstrated capabilities. As discussed in the previous section, DOD officials stated that information obtained during the first year of the flight test program is the most critical in deciding whether to enter EMD. During EMD, the contractor is to finalize SBIRS-low design, validate selected manufacturing and production processes, and fabricate and deploy the satellites. The decision to enter EMD is important because DOD will be committing several billion dollars to buy up to 24 or more satellites. If flight demonstration reveals that design changes are needed to achieve satisfactory performance, or if long lead parts for the SBIRS-low operational satellites became obsolete because their acquisition was based on an immature system design, program costs would increase.

Some program risk could also be expected because the pre-EMD phase would start from 9 to 12 months prior to launch of the flight demonstration satellites. During the pre-EMD phase, SBIRS-low users, operators, testers, and competing contractors are to refine and document system requirements, functions, and design concepts. The contractors are to also conduct cost and performance trade-offs between system requirements. Under this schedule, it would not be possible for requirements development and system design to be based on the results of the flight demonstration. In addition, SBIRS program officials stated that such concurrent scheduling would likely create difficulty in processing and assimilating the large amounts of data that would be expected from the flight demonstration and pre-EMD acquisition phases. Because of this highly concurrent schedule, the Defense Science Board questioned the value of the flight demonstration effort if the fiscal year 2002 deployment option were chosen.⁶ It stated that under the fiscal year 2002 option the effort should be terminated, ground testing should be employed instead, and the SBIRS-low program should be restructured to proceed directly into pre-EMD in fiscal year 1997.

Figure I.1 shows the planned acquisition schedules for the flight demonstration and the pre-EMD and EMD phases for the fiscal year 2002 and 2003 options, as compared to the fiscal year 2006 original schedule.

⁶The Board did not include a fiscal year 2003 option in its report.

Figure I.1: Fiscal Year 2002 and 2003 Deployment Options Compared to Fiscal Year 2006 Original Schedule



Source: Air Force briefing charts.

The fiscal year 2002 and 2003 deployment options contain substantial increased funding requirements relative to the fiscal year 2006 original schedule. The Air Force estimated that during fiscal years 1997 through 2002, these two options would require an additional \$2.1 billion and \$2.6 billion, respectively. These estimates were prepared in April 1996 and June 1995, respectively. The additional funding (1) would result from

compressing the schedule for developing and fabricating SBIRS-low and incurring associated costs sooner than originally planned and (2) would be separate from any increased costs that could occur from the scheduled concurrence, such as flight demonstration results forcing system design changes or premature acquisition of long lead parts. In commenting on our draft report, DOD stated that (1) the higher cost of the fiscal year 2003 option was due to differences in technical configuration and (2) both funding estimates were probably low, considering the level of development and production concurrency.

According to DOD officials, such funding has not been included in the future years defense program and would therefore require increased appropriations from the Congress or a reduction of funding for other DOD or Air Force programs. The importance of sufficient resources in DOD's future years defense program is to ensure program stability. In fact, DOD regulations require that no acquisition program be approved to proceed beyond program initiation unless sufficient resources, including manpower, are programmed in the most recently approved future years defense program or will be programmed in the next program objective memorandum, budget estimate submission, or President's budget.

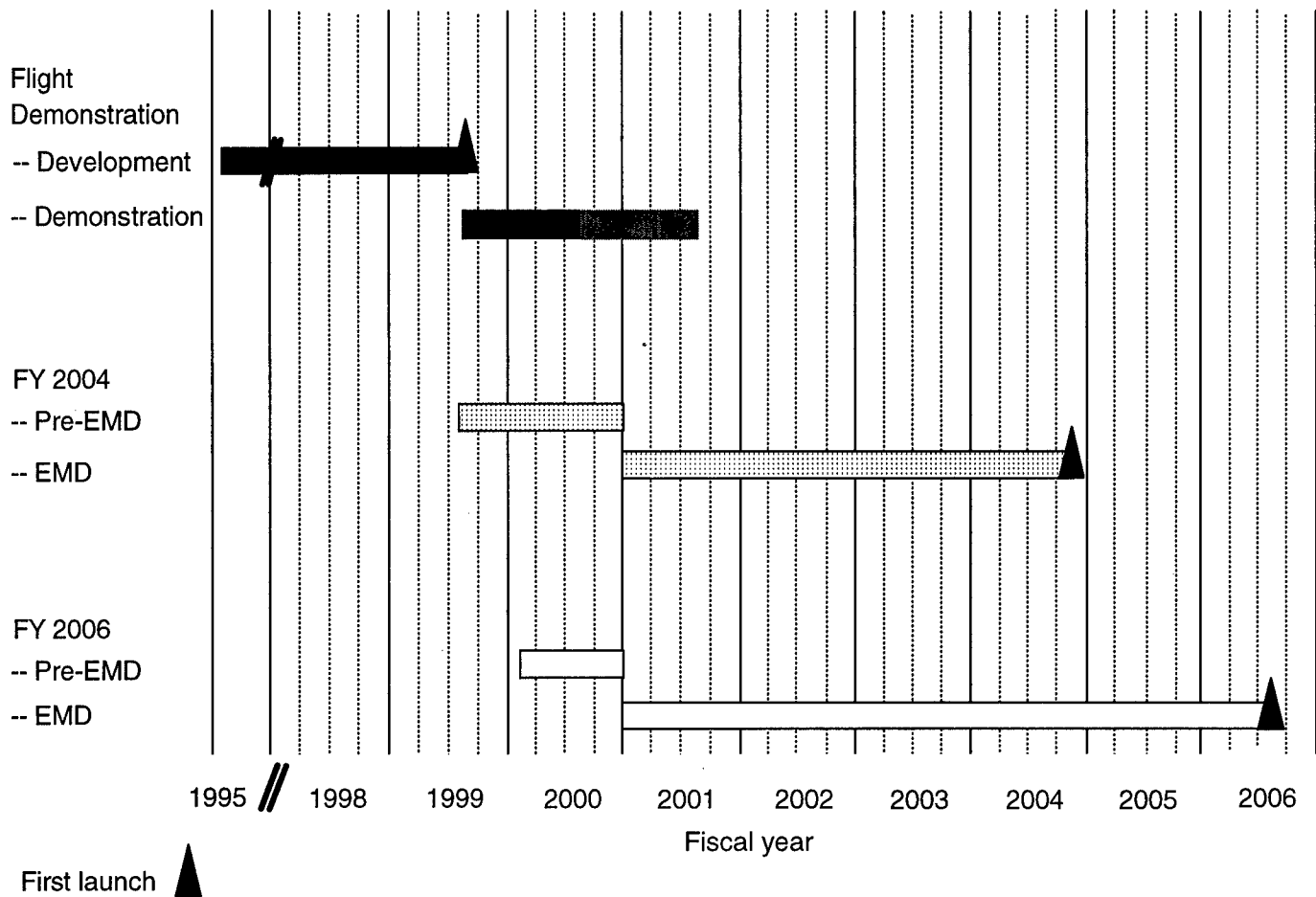
**Risk Under Fiscal Year
2004 Option Is Similar but
Requires Considerable
Additional Funding**

If SBIRS-low deployment were accelerated from the originally planned date of fiscal year 2006 to fiscal year 2004, the risk of entering EMD would be similar. However, DOD would need considerable additional funding in its future years defense program.

Figure I.2 shows that under this option the first year of the flight demonstration would be completed about 4 months before the start of EMD. Thus, DOD would have information on the demonstration satellites' performance to consider in deciding whether the system should enter the EMD phase. However, the flight demonstration and pre-EMD phase would run concurrently, not allowing demonstration results to influence requirements development and system design.

In considering this option, the Board concluded that the flight experiments (demonstration) could proceed in parallel with pre-EMD. However, the Board did not provide a reason for this conclusion. It stated that although the experiments were extremely beneficial, the associated on-orbit test plans were inadequate to fully exploit the demonstration and additional dedicated targets and test time should be added.

Figure I.2: Fiscal Year 2004 Deployment Option Compared to Fiscal Year 2006 Original Schedule



Source: Air Force briefing charts.

Similar to the fiscal year 2002 and 2003 options, the fiscal year 2004 option would require additional funding because program activities would be compressed. Air Force representatives estimated in October 1996 that an additional \$900 million would be required during fiscal years 1998 through 2003 for this option. However, in commenting on our draft report, DOD

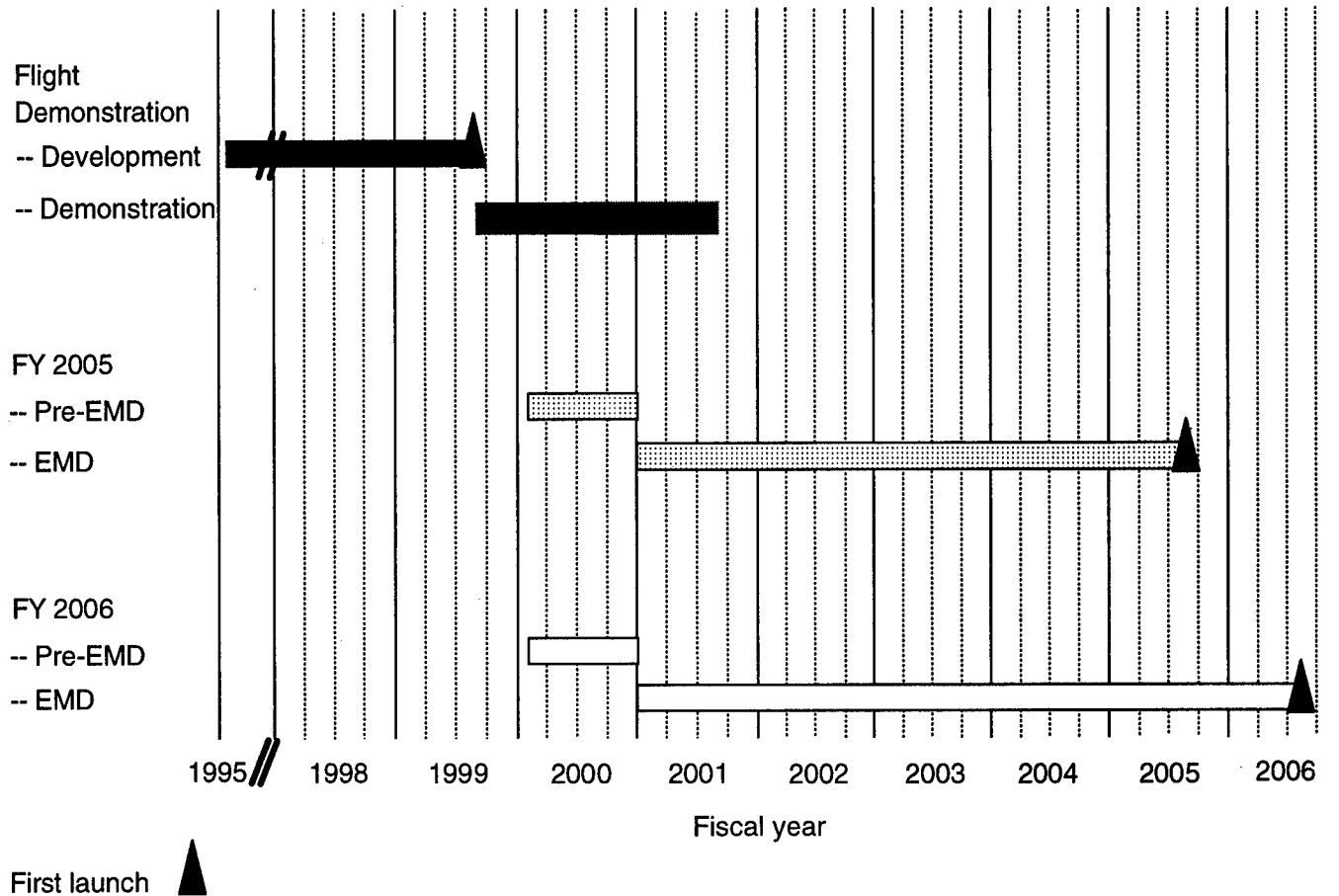
stated that a more current budget estimate revised the additional funding downward to \$509 million. The reasons given were (1) using a different launch vehicle, (2) using different inflation assumptions, (3) savings from the SBIRS-high program, and (4) better cost estimating fidelity. It also stated that the funding is included in the fiscal year 1998 future years defense program.

**Risk Under Fiscal Year
2005 Option Is Similar but
Requires Less Funding**

If SBIRS-low deployment were accelerated from the originally planned date of fiscal year 2006 to fiscal year 2005, program risk would be similar. However, the funding requirements would be less.

Figure I.3 shows that under this option the first year of the flight demonstration would be completed about 4 months prior to the start of EMD. Thus, DOD would have information on the demonstration satellites' performance to consider in deciding whether the system should enter the EMD phase. Although there is some concurrency between pre-EMD and flight demonstration under this option, such concurrency is also present in the fiscal year 2006 original schedule.

Figure I.3: Fiscal Year 2005 Deployment Option Compared to Fiscal Year 2006 Original Schedule



Source: Air Force briefing charts.

Air Force officials stated that although there are no technical constraints precluding a fiscal year 2005 deployment, they initially preferred the fiscal year 2006 deployment schedule because it allowed for a slower buildup of funding requirements. Budget estimates, which were prepared in May 1996, supporting the fiscal year 2005 deployment option showed that

**Appendix I
Program Plans, Congressional Direction,
and Deployment Options**

up to \$500-million less would be required for fiscal years 1998 through 2003 than for the original fiscal year 2006 schedule. In commenting on our draft report, DOD officials stated that the reason for the \$500-million reduction, even though it represents acceleration from the fiscal year 2006 schedule, was due to a different satellite configuration and a lower inflation rate. Thus, they stated that it was not an adequate comparison with the fiscal year 2006 configuration.

Comments From the Department of Defense



ACQUISITION AND
TECHNOLOGY

OFFICE OF THE UNDER SECRETARY OF DEFENSE

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JAN 16 1997

Mr Louis J. Rodrigues
Director, Defense Acquisitions Issues
National Security and International Affairs Division,
U.S. General Accounting Office,
Washington, D.C. 20548

Dear Mr Rodrigues:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "NATIONAL MISSILES DEFENSE: Risk and Funding Implications for the Space and Missile Tracking System", dated December 6, 1996 (GAO Code 707130), OSD Case 1262. The DoD nonconcurs with the GAO recommendation.

The Department appreciates the opportunity to comment on the draft report. The report describes many of the issues and problems that have affected the Space and Missile Tracking System (SMTS) program this past year. The Air Force and DoD have struggled with identifying deployment costs and technical risk for a variety of different satellite options and deployment dates, but have recently made key decisions which will focus development and stabilize funding.

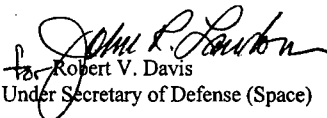
Specifically, we have upgraded SMTS to a Major Defense Acquisition Program (MDAP) within the Space-Based Infrared System (SBIRS)-of-systems and scheduled a Defense Acquisition Board (DAB) in the Spring of 1997 to formalize completion of this process. This will provide budgetary and technical discipline for the program. In addition, we have added funding to enhance the Program Definition/Risk Reduction (PDRR) phase and established a Fiscal Year 2004 deployment date to best balance technical risk and available funding. These actions have been communicated to the Congress and accepted as prudent and in conformance with their objectives. We intend to provide Congress with additional details of the new program baseline following the DAB. Given these developments, some of which occurred only in the last month, we believe the dialogue on various deployment options for SMTS has been successfully concluded. Therefore, we disagree with your conclusion that we need to continue discussions on various deployment options. SMTS suffered from program uncertainty last year and we believe a firm foundation now exists with broad Congressional support.

We hope our detailed comments will provide some explanation for the cost and technical differences you noted for various deployment options. Finally, I want to



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express my thanks for the professional nature of your staff and the good working relationship they fostered.


Robert V. Davis
Deputy Under Secretary of Defense (Space)

Attachments

Attachment 1

GAO DRAFT REPORT - DATED DECEMBER 6, 1996
(GAO CODE 707130) OSD CASE 1262

"NATIONAL MISSILE DEFENSE: RISK AND FUNDING IMPLICATIONS FOR
THE SPACE AND MISSILE TRACKING SYSTEM"

DOD COMMENTS ON THE GAO RECOMMENDATION

RECOMMENDATION: To fully inform the Congress about the feasibility and effects of accelerating the Space and Missile Tracking System (SMTS) deployment, the GAO recommended that the Secretary of Defense provide the congressional defense committees with complete, consistent, and current information that discusses program risks, revised program costs, and any additional funding needs and sources for the fiscal year 2002, 2003, 2004, and 2005 deployment options. (p. 6/GAO Draft Report)

DOD RESPONSE: We disagree with the recommendation to provide additional information on deployment options for other than the 2004 program. There is no question that the different technical assumptions and costing methodologies used for the various SMTS deployment options over the past year have caused confusion and uncertainty in Congress. The GAO report accurately identifies these problems. However, beginning with a USD(A&T) memo dated 24 July 1996, the Department has taken a structured approach to provide a firm program baseline that balances technical risk and the Congressional desire for early deployment. Following the Defense Science Board conclusion that a Fiscal Year 2004 deployment is technically prudent, the Department has focused on establishing a stable programmatic baseline to support this deployment schedule. Earlier deployments are very high risk; later deployments do not address the Congressional desire for an aggressive program to support new, high-priority missile defense systems. The Department's intent to structure an FY2004 deployment has been communicated to the Congress as the best achievable for this type of program. We have also promised to provide Congress with detailed program information following a Spring, 1997 Space-Based InfraRed System (SBIRS) Defense Acquisition Board. Further discussions of alternate deployment schedules, as contained in the GAO recommendation, are therefore not warranted and would be unproductive.

Now on p. 5.

See pp. 4-5.

Attachment 2

DETAILED COMMENTS ON DRAFT GAO REPORT ENTITLED:

"NATIONAL MISSILE DEFENSE: Risk and Funding Implications for the Space and Missile Tracking System"

See title.

General Comment: The title is somewhat misleading. The Space and Missile Tracking System (SMTS) is a key element of the objective NMD system (not the initial NMD deployment). SMTS is being pursued programmatically and organizationally as an element of the Space-Based Infrared System (SBIRS). SBIRS is a multi-mission system-of-systems which addresses requirements in the areas of missile warning, missile defense, technical intelligence, and battlespace characterization for both national and theater threats. System-of-system trades will determine the extent that SMTS will support these mission areas, in addition to NMD, in concert with the evolving threat. Recommend changing title to "Risk and Funding Implications for SBIRS-Low" (see following comment).

Now on p. 1.

General Comment: "Space and Missile Tracking System" has been replaced by "SBIRS-Low" in all current program documentation. Recommend changing "SMTS" to "SBIRS-Low" throughout the report.

Now on p. 1.

Page 1, para 2, lines 7 - 10: In recent budgetary decisions, OSD directed the Air Force to prepare cost estimates and program plans to be presented at a Spring, 1997 Defense Acquisition Board (DAB) to support an accelerated deployment commencing with the first operational launch in 2004. This deployment date conforms with the August 1996 Defense Science Board Task Force report recommendation.

Now on p. 1.

Page 1, para 3, line 1: The cost estimates were prepared as part of the Air Force and OSD SBIRS Summer Study (1994), with updates for the November, 1995 OSD-led SBIRS-Low Acceleration Options Integrated Product Team (IPT).

Now on p. 1.

Page 1, para 3, line 1: Replace \$9.3 billion with approximately \$7.0 billion. These are the correct adjusted budget numbers as a result of the SBIRS High contract award in November, 1996.

Now on p. 2.

Page 2, paragraph 2, lines 2 - 3: General comment. The Air Force did not prepare any official budgets or cost estimates that included deployment in 2003 or 2005, and therefore is not in a position to concur or dissent with the conclusions of this report when it considers these two deployment years. Any estimates for these years are drafts that were never staffed through all the cognizant Air Force offices, and therefore are unofficial. To date, none of the cost estimates in the report have been verified by OSD. The establishment of an official program baseline is a key objective of the Spring, 1997 SBIRS-Low DAB.

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Now on p. 2.

Page 3, Table 1, FY 2003 Deployment Option: The higher cost of an FY2003 deployment vice FY2002 is based on differences in technical configuration. The FY2003 SBIRS-Low is capable of a longer mean-mission duration (MMD), greater operating duty cycle per orbit, and could perform space surveillance and other secondary missions. Conversely, the FY2002 system was focused on ballistic missile defense, had a shorter MMD, and less duty cycle per orbit (reduced power/cooling). However, given the level of development and production concurrency in these two deployment options (as noted in your report), both funding estimates are probably much too low. Consequently, both have been rejected by the department in favor of an FY2004 deployment.

Now on p. 2.

Page 3, Table 1, FY2004 Deployment Option: The FY2004 acceleration costs for the FYDP are now estimated as needing an additional \$509M, not the \$900M shown. Reductions are due to changing to the Evolved Expendable Launch Vehicle (from Delta II), savings transferred from the SBIRS-High program, different inflation assumptions, and better fidelity in cost estimating with a more mature SBIRS-Low program.

Now on p. 3.

Page 3, Table 1, FY2005 Deployment Option: The reduced cost of this option (i.e., \$500M less than the FY2006 option), even though it represents acceleration from the baseline schedule, is due to reduced technical content in the program. The system would have reduced capability similar to the accelerated FY2002 program (i.e., short on-orbit life, less duty cycle, less capability in secondary missions, etc.) and is thus not an adequate comparison to the baseline FY2006 configuration.

Now on p. 3.

Page 4, para 2, line 3: Change "... SMTS development and fabrication ..." to "... SMTS Engineering and Manufacturing Development (EMD) ...". The flight demonstration and EMD phases would be sequential for the FY2004 program, as stated. However, the pre-EMD phase which begins a year earlier would be concurrent with the flight demonstrations. The Defense Science Board believed this level of concurrency was acceptable, though it does increase risk to the program.

Now on p. 3.

Page 4, para 2, lines 9 - 11: Recent budgetary actions have identified additional funding needed in the FYDP to support an FY2004 deployment. The Air Force will present its refined cost estimate for the FY2004 deployment to the Defense Acquisition Board in Spring 1997, and upon approval by the Undersecretary of Defense for Acquisition, will incorporate this new baseline into future budget submissions.

Now on p. 3.

Page 5, paragraph 2, line 4: DoD is no longer "considering" accelerating SBIRS-Low deployment, but has issued budgetary direction to the Air Force to program for an accelerated deployment with first launch in FY2004. The Air Force will prepare cost estimates and program plans to be presented at a Spring 1997 Defense Acquisition Board to support an accelerated program.

Now on p. 4.

Page 5, para 3, lines 5 - 7: The Air Force plans to complete a more accurate cost assessment in preparation for the SBIRS Low DAB program review in Spring 1997. The

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cost assessment will support a FY2004 deployment. For risk reduction and to encourage competition, the Air Force recently awarded a Program Definition and Risk Reduction contract to Rockwell. The contract provides a low altitude demonstration system that will reduce risk by developing an alternative satellite design and ground demonstration to the TRW/Hughes system. It will also serve as a backup if the TRW/Hughes Flight Demonstration System fails.

Page 5, "Recommendations": See Enclosure 1 comments.

Page 6, para 3, lines 4 - 9: The deployment options were completed at different times to support different requests, i.e., Congressional inquiries, program reviews, etc., which led to apparent disparities in cost and technical estimates. In addition, the estimates provided for FY2003 and FY2005 were internal working drafts that were never staffed throughout the Air Force, and have not been validated.

Page 10, para 2, lines 8 - 10: The Defense Resources Board (DRB) following the 1994 SBIRS Summer Study concluded that expanding theater warning requirements (based on DESERT STORM experience) required new sensor technology to be fielded as early as possible. This led to moving the SBIRS-High component date forward to FY2002 from the FY2004/5 deployment date used for the FEWS and ALARM programs (previous DSP follow-on programs; neither entered EMD). Requirements for these capabilities were codified and approved in the SBIRS Capstone Requirements Document validated by the JROC in April 1996.

Page 10, para 3, line 1: The referenced study was known as the "OSD Space-Based Warning Summer Study" chaired by Mr Keith Hall from ASD/C3I.

Page 11, para 1, line 7: The government reference baseline is 24 satellites. However, the SBIRS-Low constellation could consist of more satellites depending on contractor cost and performance trades between numbers of satellites, radiation hardening requirements, and on-orbit lifetime.

Page 11, paragraph 2, lines 4 - 8: Replace "Phase 1" and "Phase 2" and "Phase 3" with "Increment 1," "Increment 2", and "Increment 3". This reflects the current nomenclature.

Page 13, para 2, lines 8 - 10: The original purpose of the Spring 1997 DAB was to finalize the documentation required for SBIRS-Low as a Major Defense Acquisition Program (MDAP) and to select a deployment schedule. However, recent DoD action has directed an FY2004 deployment schedule, which will be considered the baseline for the FY1998 budget submittal and the Spring 1997 DAB. Other deployment options will not be reviewed.

Page 13, para 3, lines 1 - 3: The Competitive Demonstration/Validation program has been renamed Low Altitude Demonstration System (LADS).

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Now on p. 15.

Page 13, para 4, lines 1 - 2: The flight demonstrations are not to 'validate' key technologies; the Air Force is confident that the technologies are mature enough to incorporate into flight-worthy demonstration systems. Also, the demonstrated insertion of the SBIRS Low component into the System of Systems Architecture as an overall contributor to meeting all SBIRS mission areas, not just missile defense, should be noted.

Now on p. 15.

Page 14, para 1, lines 1 - 3: Program Decision Memorandum - II (PDM II) approved additional TMD and NMD targets for the flight demonstration systems. It included funds for one TMD and one NMD target for the Low Altitude Demonstration System. It also added a TMD target for the Flight Demonstration system.

Now on p. 15.

Page 16, para 1, line 3: Current program plans include a 2-year flight demonstration.

Now on p. 17.

Page 16, para 2, line 2: The flight demonstrations are not to 'validate' key technologies; the Air Force is confident that the technologies are mature enough to incorporate into flight-worthy systems. Better terminology would be "validate the integration of key technologies".

Now on p. 17.

Page 16, paragraph 2, line 8: The number of satellites (24) is the government baseline, and may be subject to change upon EMD contract award for the SBIRS Low Component, depending on the winning contractor's satellite and constellation design.

Now on p. 19.

Page 19, para 2, lines 1 - 3: The Defense Science Board believed that sufficient information would have been developed through ground simulations, fabrication/integration of the flight vehicles, and results from component testing to allow the pre-EMD phase of SBIRS-Low to proceed in parallel with the actual flight demonstrations. The DSB agreed that proceeding into EMD (involving orders for long-lead components, etc.) without data from the flight demonstrations would be too risky.

Now on pp. 20-21.

Page 20, paragraph 1, line 5: Current refined budget estimates for the FY2004 deployment have been revised downwards to \$509M for FY1998 through FY2003."

Now on p. 21.

Page 20, para 2, lines 2 - 3: Funding for the FY2004 deployment has been approved by OSD and the Air Force has been directed to adjust the SBIRS-Low baseline accordingly.

Now on pp. 22-23.

Page 21, paragraph 1, line 6: The \$500 million figure for an FY2005 deployment is an unofficial estimate. The assumptions for an FY2005 program were different than those assumptions made for the baseline FY2006 program. The FY2005 program used a different satellite configuration and lower inflation adjustment.

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